

## **Femoral Neck Fracture in a Child As a Technical Pitfall During Triple Innominate Osteotomy**

Mohammed M Zamzam, MD\*

**Iatrogenic fracture neck of the femur in a nine year old girl is reported. The fracture occurred as a technical pitfall during triple innominate osteotomy for persistent acetabular dysplasia of her right hip. Fracture was fixed in the same sitting and the triple osteotomy was completed.**

***Bahrain Med Bull 2004;26(4):***

Persistent acetabular dysplasia and residual hip subluxation are well known causes of premature secondary arthrosis of the hip joint<sup>1-3</sup>. The rationale for treatment of these conditions is to restore the anatomical and biomechanical relationship<sup>1,4,5</sup>. The treatment is based on the patient's age and the hip congruity. In older children and adolescents with congruent hips, a triple innominate osteotomy appears to accomplish these goals by increasing the area of weight-bearing hyaline cartilage available for the femoral head<sup>2,3,5,6</sup>.

Several techniques have been described to perform triple innominate osteotomy by cutting the innominate bone with slightly different methods, but all render the acetabulum mobile<sup>3,7-9</sup>. Many complications were reported for the different techniques, including sciatic and femoral nerve palsies, pudendal and inferior gluteal neurovascular injuries, medial circumflex artery injury, symptomatic non union of ischial or pubic osteotomy sites and post surgical infection<sup>3,6,10-12</sup>.

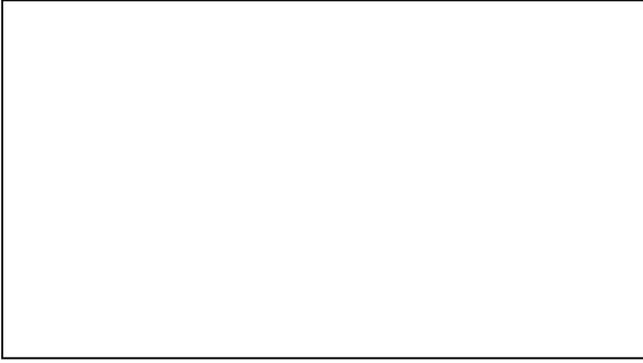
Femoral neck fracture as a complication during triple innominate osteotomy is described here, which to the best of the author's knowledge has not been reported before. It is a technical pitfall to be avoided while performing the osteotomy of the ischial ramus.

### **THE CASE**

A nine year old girl known to have developmental dysplasia of the right hip (DDH), presented with painless limping and positive Trendelenburg's sign of the affected side. Radiographs of the pelvis demonstrated persistent right acetabular dysplasia with lateralization of the femoral head (Fig.1). The center edge angle was 5 degrees and the acetabular index was 37 degrees.

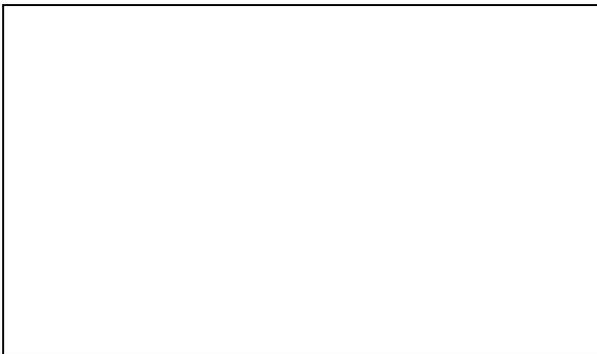
---

\* Assistant Professor &  
Consultant Orthopaedic Surgeon  
Department of Orthopaedics (49)  
King Khalid University Hospital  
Riyadh  
Saudi Arabia



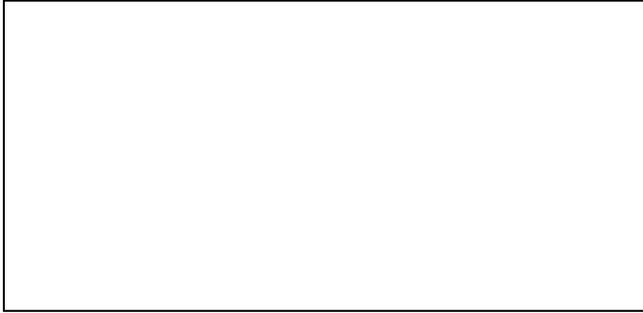
*Figure 1. Anteroposterior pelvic radiograph of the reported patient showing persistent right acetabular dysplasia.*

Periacetabular triple innominate osteotomy through subinguinal adductor approach was performed<sup>13</sup>. During surgery, the dissection to expose the ischial ramus was carried out lateral to the pectineus muscle trying to perform the osteotomy as close as possible to the acetabulum to achieve better correction. The osteotomy was carried out by mistake in the femoral neck instead of the ischial ramus. It involved about one third of the femoral neck thickness before the complication was discovered. The femoral neck fracture was fixed with two cannulated cancellous screws (Fig.2). The ischial ramus was exposed medial to the pectineus muscle and the triple osteotomy was completed as usual.



*Figure 2. Pelvic x-ray of the patient after triple osteotomy with two cancellous screws fixing the femoral neck fracture.*

Hip spica cast was applied for six weeks after which the patient was mobilized full weight-bearing. Two years post-operatively, the patient was pain free and had normal gait. The affected hip showed full range of motion. Radiologically, the femoral neck fracture has healed fully and the femoral head was well covered (Fig.3). The center edge angle was 19 degrees and the acetabular index was 20 degrees.



*Figure 3. Pelvic x-ray after removal of the screws showing good acetabular cover and healing of the femoral neck fracture*

## DISCUSSION

Each technique of triple innominate osteotomy has its inherent disadvantages. Some need a second incision for the osteotomy of the ischium, others need turning the patient during surgery to approach the ischium in prone position<sup>3,9,11</sup>. Most techniques produce a large acetabular fragment maintaining the sacrotuberous and sacrospinous ligaments. Rotation of the fragment is around a point distant from the center of the femoral head, thus correction of the deformity is suboptimal especially when compared to newer techniques such as the periacetabular osteotomy developed by Ganz et al. However, periacetabular osteotomy is technically demanding and requires careful three-dimensional planning<sup>3,7,8,13</sup>.

The technique of periacetabular triple innominate osteotomy through subinguinal adductor approach developed by Tachdjian was preferred by the author<sup>13</sup>. This approach exposes the ischium and the pubis through a single transverse medial-adductor incision, which is cosmetically pleasing. Taking a wedge of bone from the upper ischial ramus based anteriorly and laterally, allows medial relocation of the hip joint<sup>13</sup>. In this technique the ischial osteotomy is performed in the upper ischial ramus between the tuberosity and the spine of the ischium, maintaining the sacrospinous ligament attached to the acetabular fragment, which limits the rotation of the fragment and the amount of correction<sup>9</sup>. In the reported case the aim was to perform the ischial osteotomy above the ischial spine to be closer to the hip joint and to free the acetabular fragment from all pelvic ligaments in the hope of allowing better correction.

Kleuver et al emphasized that the ischial cut of triple innominate osteotomy through anterior approach must be below the sacrospinous ligament, halfway between the ischial spine and the ischial tuberosity<sup>10</sup>. They stressed that the osteotomy cannot be brought further proximal because the femoral neck will be in the way<sup>10</sup>. This pitfall occurred in the reported case. The resulted complication could have been avoided if the described technique was followed strictly.

## CONCLUSION

**It is recommended that the ischium and pubis be exposed “medial” to the pectineus and not “lateral” to avoid exposing the femoral neck and possibly mistaking it as the pelvic ramus as happened in the case.**

## REFERENCES

1. Faciszewski T, Coleman SS, Biddulph G. Triple innominate osteotomy for acetabular dysplasia. *J Pediatr Orthop* 1993;13:426-30.
2. Gillingham BL, Sanchez AA, Wenger DR. Pelvic osteotomies for the treatment of hip dysplasia in children and young adults. *J Am Acad Orthop Surg* 1999;7:325-37.
3. Peters CL, Fukushima BW, Park TK, et al. Triple innominate osteotomy in young adults for the treatment of acetabular dysplasia: a 9-year follow-up study. *Orthopedics* 2001;24:565-9.
4. Guille JT, Forlin E, Kumar SJ, et al. Triple osteotomy of the innominate bone in treatment of developmental dysplasia of the hip. *J Pediatr Orthop* 1992;12:718-21.
5. Hsin J, Saluja R, Eilert RE, et al. Evaluation of the biomechanics of the hip following a triple osteotomy of the innominate bone. *J Bone Joint Surg [Am]* 1996;78:855-62.
6. de Kleuver M, Kooijman MA, Kauer JM, et al. Pelvic osteotomies: anatomic pitfalls at the pubic bone. A cadaver study. *Arch Orthop Trauma Surg* 1998;117:370-2.
7. Ganz R, Klaue K, Vinh TS, et al. A new periacetabular osteotomy for the treatment of hip dysplasia: technique and preliminary results. *Clin Orthop* 1988;232:26-36.
8. Steel HH. Triple osteotomy of the innominate bone. *J Bone Joint Surg [Am]* 1973;55:343-50.
9. Tonnis D, Behrens K, Tucharani F. A modified technique of the triple pelvic osteotomy: early results. *J Pediatr Orthop* 1981;1:241-9.
10. de Kleuver M, Kooijman MA, Kauer JM, et al. Pelvic osteotomies: anatomic pitfalls at the ischium. A cadaver study. *Arch Orthop Trauma Surg* 1998;117:376-8.
11. de Kleuver M, Kooijman MA, Pavlov PW, et al. Triple osteotomy of the pelvis for acetabular dysplasia: results at 8 to 15 years. *J Bone Joint Surg [Br]* 1997;79:225-9.
12. Lee DY, Choi IH, Chung CY, et al. Triple innominate osteotomy for hip stabilization and transiliac leg lengthening after poliomyelitis. *J Bone Joint Surg [Br]* 1993;75:858-64.
13. Tachdjian MO. Hip dysplasia in the adolescent. In: Tachdjian, ed. *Pediatric Orthopedics*. Philadelphia: WB Saunders Company: Harcourt Brace Jovanovich Inc, 1990:468-549.